Section I: Introduction & Study Background

"A river is more than an amenity, it is a treasure."

Oliver Wendell Holmes

The lower Delaware River flows through the very heart of the birthplace of our great nation. Every bend in the river speaks to us of history, of beauty, of opportunity — of life itself. Its fresh, free-flowing water nourishes human inhabitants as it has for over twelve thousand years. Along its path evolved the greatest economy in the world. Our nation's history is revealed in the agricultural fields, forests, canals, villages, mills and inns along its path. Diverse flora and fauna thrive on its banks and islands. Its natural beauty inspires serenity. Yet today the Delaware River supports one of the country's largest concentrations of population and industry. Our challenge is to manage the growth and use of the corridor and its resources to protect its outstanding character. Unmanaged development and inappropriate use of the corridor's resources would lead to a degradation of the water quality, loss of habitat for endangered and valuable wildlife and plant species, and destruction of its natural beauty and charming historic sites.

Bill Sharp

Concerned about the future of the Lower Delaware River, interested citizens and organizations encouraged their representatives in the United States Congress to authorize a study of the river. This document presents the results of the Lower Delaware National Wild and Scenic River Study, authorized by Public Law 102-460. It summarizes the extensive resources associated with the lower Delaware River, the River Management Plan, and the eligibility and suitability of the study segments for National Wild and Scenic Rivers designation.

Wild and Scenic Rivers Act

The National Wild and Scenic Rivers Act (P.L. 90-542, as amended) was enacted in 1968 to balance long standing federal policies that promoted the construction of dams, levees, and other river development projects with a program that would permanently preserve selected rivers, or river segments, in their free-flowing condition. Section 1 (b) of the Act states:

> "It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."

The original Act designated eight rivers as components of the National Wild and Scenic Rivers System, and specified processes by which other rivers could be added to this system.

As of January 1998, one hundred fifty-four rivers or river segments totaling almost 11,000 miles had been included in the national system. Only six of these rivers are located in the Mid-Atlantic states: the upper and middle sections of the Delaware River in Pennsylvania, New York and New Jersey; the Great Egg Harbor River and the Maurice River in New Jersey; the Allegheny River and Clarion River in Pennsylvania; and the Bluestone River in West Virginia.

The National Wild and Scenic Rivers Program is designed to provide river protection through the combined efforts of private landowners and other citizens, river related organizations, and all levels of government. Emphasis is given to protection of landowners' rights. Designation does not open pri-

vate lands to public access, nor does it affect existing uses of private property.

Each designated river receives permanent protection from federally-licensed or assisted dams, diversions, channelizations, and other water resource projects that would have direct and adverse effects on the river's free-flowing condition or outstanding resources. The Wild and Scenic Rivers Act explicitly prohibits new dams and hydroelectric projects licensed by the Federal Energy Regulatory Commission (FERC) on or directly affecting a designated river segment, and requires that all other proposed federally-assisted water projects be evaluated for their potential impacts on the river's special features. Projects that would result in adverse impacts on the designated segment are precluded under the Act.

Requirements for Designation

To be eligible, a river must be free flowing and possess at least one outstandingly remarkable resource . . .

Before a river can be added to the National Wild and Scenic Rivers System, it must be found both eligible and suitable. To be eligible, the river must be i) free-flowing; and, ii) possess at least one "outstandingly remarkable" resource value, such as exceptional scenery, recreational opportunities, fisheries and wildlife, historic sites, or cultural resources. The resource values must be directly related to, or dependent upon, the river. The determination of a resource's significance, i.e. the degree to which it fulfills the "outstandingly remarkable" requirement, is based on the professional judgment of the study team.

The suitability determination is based upon several findings. First, there must be evidence of lasting protection for the river's free-flowing character and outstanding resources, either through existing mechanisms (including patterns of conservation land ownership, state and local land use regulations, physical barriers to inappropriate development, etc.), or through a combination of existing and new conservation measures resulting from the wild and scenic study. Second, there must be strong support for designation from the entities — local municipalities, state agencies, riverfront landowners, conservation organizations — that will be partners in the long-term protection of the river. Third, a practical management framework must be devised that will allow these interests to work together as effective stewards of the river and its resources. Finally, wild and scenic designation must make sense for the river in question: it must be an appropriate and efficient river conservation tool.

In proposing a river for designation, a recommendation is also made regarding the river's proposed classification . The classification — wild, scenic, or recreational — is based solely on the intensity of human presence along the river corridor, in the form of railroads, highways, utility lines, buildings, etc., at the time of classification. A river's classification is principally used to guide future actions by federal agencies on projects affecting federally-owned lands (e.g., whether the construction of a new boat ramp is appropriate).

The Act defines the three classifications as follow:

Wild river areas — Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds and shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Scenic river areas — Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational river areas — Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Lower Delaware Wild and Scenic River Study

Passed by Congress in 1968, the intent of the Wild and Scenic Rivers Act is to establish a national system to protect selected free flowing rivers with outstanding natural, cultural and recreational features for the benefit and enjoyment of present and future generations. The Act is designed to provide river protection through the combined efforts of private landowners and other citizens, river related organizations, and all levels of government. Emphasis is given to protection of landowners' rights, and there is no federal intent to acquire land along the segments of the river being studied. Designation does not open private lands to public access, nor does it affect existing uses of private property.

"Here is a river so long settled and so much changed one can look at it anew, a modern river in an ancient course, an ancient river in a modern world."

Bruce Stutz; Natural Lives, Modern Times, People and Places of the Delaware River.

Recognizing the nationally significant resources of the Delaware River, Congress has designated two sections of the river as part of the National Wild and Scenic Rivers System. The Delaware Water Gap National Recreation Area was designated in 1978 and contains 37 miles of the river that provides recreational opportunities such as canoeing, tubing, and rafting. This unit of the National Park Service is managed like a traditional national park with extensive federal and state land holdings. Above that is the Upper Delaware National Scenic and Recreational River, 73 miles of clear, free-flowing stream winding its way through a valley of swiftly changing scenery. Management of Upper Delaware Scenic and Recreational River is a partnership of private individuals and local, state, and federal governments.

The Lower Delaware River Wild and Scenic River Study was authorized by Congress on October 23, 1992, through P.L. 102-460. The study area as defined by Congress is the river between the Erie Lackawanna Bridge south of the Delaware Water Gap National Recreation Area, and Washington Crossing, Pennsylvania. In addition, Congress authorized the development of a Conservation Plan for the segment south of Washington Crossing to the Rancocas Creek in New Jersey and the Poquessing Creek in Pennsylvania (the southern boundary of Bucks County, Pennsylvania). Three tributaries, Cooks, Tinicum and Tohickon creeks in Bucks County were included in the study legislation. The purpose of the study was to determine whether this portion of the lower Delaware River is eligible and suitable for inclusion in the National Wild and Scenic Rivers System. The study identified ten segments in the study area to be considered for National Wild and Scenic classification. The segments lie between the Erie Lackawanna Railroad Bridge in Knowlton Township, NJ, and Washington Crossing, PA, and include the three tributaries. The more developed and industrial parts of the river corridor were excluded from consideration into the National System.

The Lower Delaware National Wild and Scenic River Study Task Force consisted of following six committees:

Advisory Committee — the coordinating body for the study, guiding all major activities

Management Committee — led development of the River Management Plan

Local Government Committee — provided the local government perspective for the 57 municipalities in the study corridor

Public Outreach Committee — sponsored the public outreach activities, including public workshops and the landowner survey

Resource Committee — collected data regarding the natural, cultural, historical, recreational and scenic resources associated with the river corridor

Economic Development Committee — represented economic interests

To increase the effectiveness of the study's public outreach activities and to facilitate the compilation of resource information, a cooperative agreement was established between the NPS and the Delaware River Greenway Partnership. The agreement also provided for the creation of a Geographic Information System (GIS). The GIS contains up-to-date information about the location of many natural and cultural resources. GIS maps provided for the study include base maps, wetlands and floodplains, and resource maps for each municipality.

Study Goals

Based on the study background and legislative directive, the NPS had two major goals:

1) To determine whether the lower Delaware River and select tributaries are an appropriate addition to the National Wild and Scenic Rivers System, and, conversely, whether wild and scenic designation is an appropriate protection tool for the rivers: and

2) To assist local communities in preparing and implementing a river conservation plan that protects the river's special qualities, regardless of whether wild and scenic designation proved to be the recommenced outcome of the study.

In accordance with legislative directives, wishes of study area communities, and established NPS policy for wild and scenic studies of "private lands" rivers, the study included the following elements:

1) A strong emphasis on grassroots involvement and consensus-building in determining whether the rivers were suitable for designation and how they should be managed.

2) The development of the "comprehensive river management plan" specified in the Act during the study rather than after designation. This plan relies on private, local

and state conservation measures rather than federal land acquisition and direct management to protect the river's outstanding resources, and was the product of close collaboration between NPS, the Study Task Force, and local and state governments.

3) A commitment to the study area communities that federal designation would only be recommended if strong support was expressed through passage of resolutions by the affected municipalities. Municipal resolutions were requested after completion of the River Management Plan in order to ensure the clarity of what was being proposed.

Public Involvement

The Study Task Force and its committees were the focal points for involvement. The Public Outreach Committee coordinated public involvement, including:

- the development of mailing lists of over five hundred entries, including key local officials, riparian landowners, and other interested individuals. Those on the lists received meeting notices, minutes, progress reports, and draft documents for comment.
- frequent meetings of study committees at various locations within the six county study area. The meetings were advertised through mailings and the local press.
- six public forums held during the beginning of the study to identify issues of importance to area residents and river users, and also to identify sources of river-related expertise.
- public forums held to educate interested parties to receive feedback regarding the River Management Plan.
- special events held to promote public awareness of the study and the unique qualities of the river.
- the International Countryside Exchange planning charette to focus attention on the section of the river below Washington Crossing.
- presentations to municipalities.
- a landowner survey in which all landowners adjacent to the river were asked to describe their river management issues and interest in river protection. Over 2000 landowners were surveyed.

River Management Plan

Development of a River Management Plan is a required component of the Lower Delaware River Wild and Scenic River Study. The Management Plan recommends actions to maintain and improve the lower Delaware River, its tributaries and surrounding natural, historic and cultural resources. It provides for economic growth in a manner that does not adversely affect the region's exceptional river-related resources.

The Plan has been compiled by the Lower Delaware National Wild and Scenic River Study Task Force Management Plan Committee and Local Government Committee, with assistance from the National Park Service, Northeast Region. The Committee is chaired by James C. Amon, Executive Director, Delaware and Raritan Canal Commission, and is made up of regional, state, and local agency representatives, landowners, conservationists, business people, and other stakeholders in New Jersey and Pennsylvania. (See Appendix B)

The River Management Plan is discussed in more detail in Section IV of this report.

Chuck Barscz

Canoeing the Delaware

The Delaware River

The Delaware River begins in the small town of Hancock, New York, where the East and West branches join. It flows south for 330 miles along four state boundaries to the sea. There are no dams on the main stem, making it the last major free-flowing river in the eastern United States.

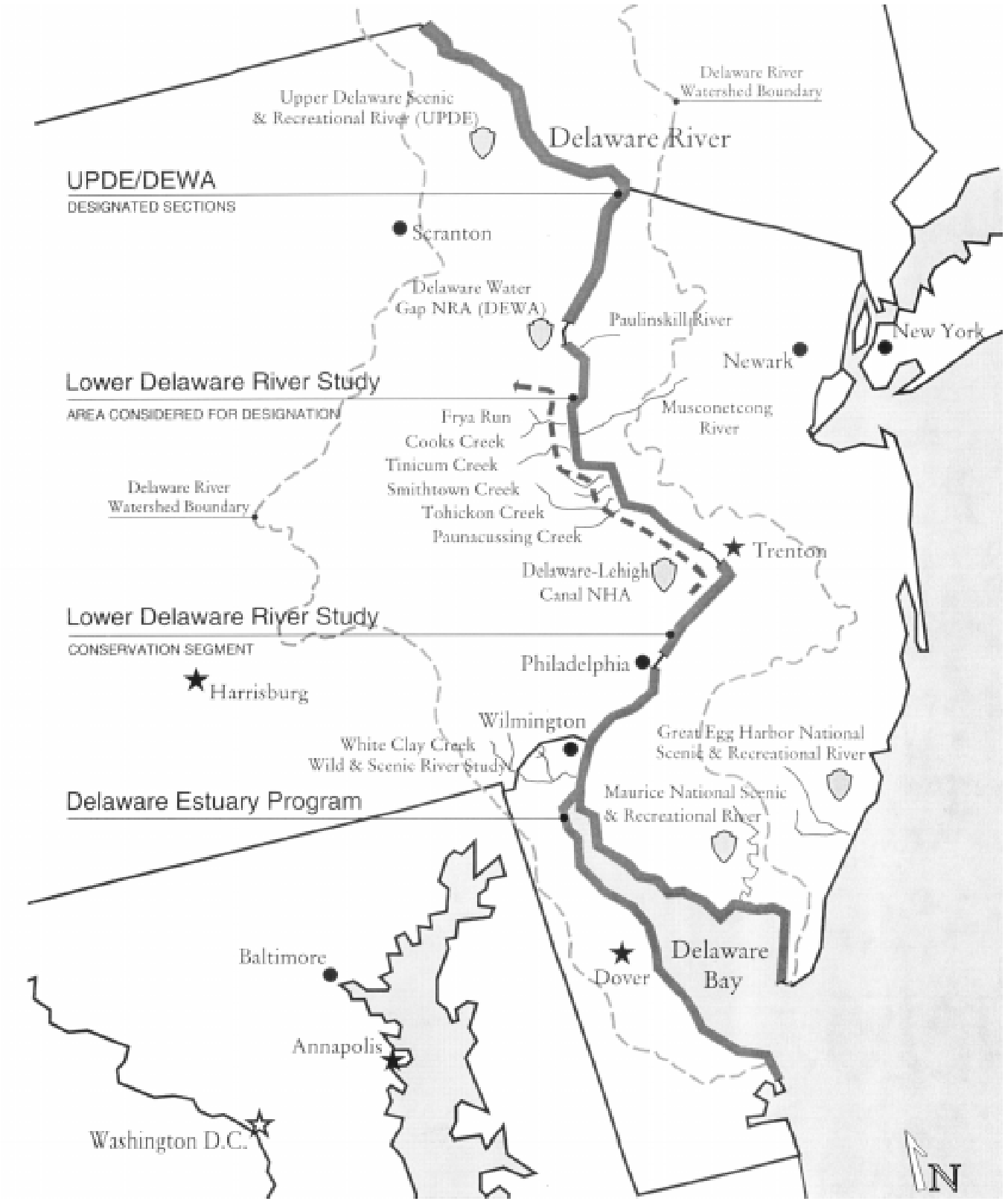
The Delaware is shaped by the varied geology through which it has carved its exit to the Atlantic Ocean. The river has carved its signature through many geologic formations: through the Appalachian Highland rock laid down 600 million years ago and through the folded Valley and Ridge formations created by the force of colliding tectonic plates and the raising of the modern Appalachian Mountains. The most unforgettable example is the Delaware Water Gap with its 1000-foot cliffs. This formation is explained by geologists as the consequence of land being uplifted as the erosive forces of the river and wind cut downward.

As the Delaware passes the mouth of the Lehigh River at Easton, PA, it enters the rolling landscape of the Piedmont region. Below Easton, at what geologists call the "Reading Prong," ancient pre-Cambrian and Cambrian formations are encountered, where the river has ground its way across four miles of granite, gneiss, and quartz at Riegelsville, PA. There the next great formation, the Triassic Lowlands, begin with its hard Brunswick and Lockatong shales where dinosaur fossils still lie deep under foot. This is a much younger land, whose granites, shales, limestones, and sandstones date from the Triassic Period, some two hundred and twenty-five million years ago. The river becomes broader and shallower below Easton, widening to 500 feet at Frenchtown, New Jersey, and is dotted with islands that are built of materials brought to the valley by the glaciers of the Pleistocene Epoch, between eleven thousand and five hundred thousand years ago. Most river islands are covered with a dense network of trees and vines.

The Triassic shales once lay thousands of feet above present ground levels, and in some places the molten mantle of the earth pushed up into the old lake-beds and cooled, leaving diabase. The hard diabase forced the river to curve at the great, dark three hundred foot cliffs above Upper Black Eddy. Diabase intrusions created stone sills and dikes, which impede underground water flows, are very hard to dig in, and have left deposits of "trap-rock" with commercial value. These deposits are mined and crushed into gravels.

Delaware River Watershed

National Wild & Scenic Rivers



From Stockton, NJ, south the gradually flattening landscape and softer soils have supported greater development. The tough pre-Cambrian rocks that formed the ancient continental shelf reappear as the rapids at the Calhoun Street Bridge between Trenton, NJ, and Morrisville, PA. Here a limestone ridge cuts across the river creating a series of falls. Above the falls the river is entirely fresh water. Below the falls the river is influenced by tides of up to eight feet. Strictly speaking, this area is not estuarine, where fresh water and brackish water from the sea mix, but the portion of the river below Trenton is generally thought of as the Delaware Estuary.

Below Trenton the river leaves the Piedmont landscape and enters the flat Coastal Plain. This a younger land still, characterized by sands, clays, and gravels that have not yet consolidated into stone. These materials are sediments that date from the Tertiary Period, two to fifty million years ago.

Delaware Estuary Management Plan

Philadelphia skyline from the Delaware River.

The southern portion of the Delaware River flows through metropolitan Philadelphia, the nation's fifth largest urban area, having a population of 5,892,937 people (U.S. Census 1990). Below Philadelphia, the river passes Wilmington, Delaware and enters the Delaware Bay, which flows into the Atlantic Ocean. This region supports the Ports of Philadelphia, Camden and Wilmington, valuable fisheries, and a growing recreational industry. The Delaware serves as the largest freshwater port in the world, with vigorous shipping facilities serving petroleum tankers and other cargo carriers.

The watershed of the Delaware River is 12,757 square miles, more than one and a half times the size of New Jersey. About one half of the watershed is in Pennsylvania, slightly less than a quarter is in New Jersey, and the remainder is divided between New York and Delaware. The watershed contains 42 counties and 838 municipalities. (See Watershed Map page 10.)

Despite its intensive use, density of development, and commercial activity, much of the Delaware conveys a sense of a river that is largely unaffected by the hand of man. Frequent floods have kept development away from most islands and much of its shore. Hence, the river corridor possesses a surprising degree of natural beauty and provides important wildlife habitat. These values, and the great affection for the river widely shared among residents of the region, have led to the inclusion of both the Upper Delaware and the Middle Delaware

"The Delaware I find really intriguing because it . . . runs on the border of megalopolis, and yet it is, at this stage, such a clean, productive river . . ."

Kenneth Lewis, Manager, Delaware Canal State Park

in the National Wild and Scenic Rivers System. The Upper Delaware extends from Hancock, New York, 73 miles downstream and became part of the Wild and Scenic Rivers System in 1978; the Delaware Water Gap National Recreation Area was also added to the System in 1978. With the lower Delaware River being studied for designation, it is possible that the length of the river from Trenton, NJ, north (with exception of a few short sections that are considered too densely developed) could have national designation as a Wild and Scenic River, and from Trenton south, as a National Estuary. The Delaware would become the only river system in the eastern U.S. with such a distinction.

The water quality of the Delaware River has undergone dramatic changes. Water quality was presumably pristine until the seventeenth century when European settlers cleared much of the land in the river corridor and drained wetlands for farming. Further declines in water quality from sewage systems and industrial waste continued to grow until after World War II. Since the 1950's, regulations on discharges into the river have resulted in a significant reduction of pollution from point sources. More recently there have been efforts to control non-point source pollution, which commonly comes from storm water runoff. Today the river water quality in the plan area is considered good, though problems still exist in the major tributaries, and the river is sometimes subject to fish advisories due to excessive toxics (for specific information on water quality see page 16).

Nearly 10% of the population of the United States relies on the Delaware River for drinking water.

While the main stem of the Delaware is free-flowing, there are impoundments on its tributaries and major diversions of its water out of the river basin, thus river flows are significantly regulated. The river drains only 0.4% of the nation's land area, yet it provides drinking water for much of the densely populated area between New York City and Philadelphia, home to more than 20 million people — nearly 10% of the U.S. population. Over many decades a system of huge diversions of water and impoundments on the river's tributaries has changed the natural flow of the Delaware into an enormous computerized water supply system.

The river system is complex and management of the river is just as complex. Water flow is heavily managed to provide drinking water and to supply industrial users. Land use in the watershed, which affects water quality and flow, is locally managed by 838 municipalities and thousands of landowners, large and small.

"Today the Delaware River, once foul-smelling and oxygen-starved as it flowed past Philadelphia and neighboring cities, supports year-round fish populations..."

Delaware River Basin Commission Annual Report 1994

The primary management of the river is overseen by the Delaware River Basin Commission (DRBC), a regulatory agency comprising the river's four boundary state governors and a federal representative, traditionally the Secretary of the Interior. The powers granted to the Commission to plan and regulate water conservation and use in the Delaware Watershed place it in a central river management role, particularly for water supply and quality issues. Recent Congressional action to eliminate funding of the federal commissioner's office raises uncertainties concerning DRBC's future, a matter of concern given the critical role it plays in maintaining water quality and balancing water supply, as well as ecological and recreational needs.

The river's water is distributed according to interstate agreements, known in aggregate as the Delaware River Compact, a multi-state commercial contract that was created in 1961 to settle bitter interstate disputes. The compact was an outgrowth of court decisions in 1929-30 and in 1954 which determined that New York City could withdraw up to 800 million gallons per day (MGD), New Jersey could take up to 100 MGD, and that Pennsylvania's allocation would be set on the basis of individual proposals from that state.

Regulators must continually ask whether at any given time there is enough water in the Delaware River to keep the river vital and to deliver water to their customers. In arriving at a sustainable water budget the DRBC considers many complex factors, but primarily the fullness of New York City's reservoirs, while assuring an adequate amount of water for downstream users. In normal times the process of determining patterns of releases from upstream reservoirs requires balancing a complicated flow formula, but some ecologists claim that it fails to provide the river with adequate water during periods of low flows, which come with regularity because the region's annual precipitation can vary greatly from year to rear.

South of the study area is the Delaware Estuary and Bay, the significance of which is recognized by the Delaware Estuary Program. It is important to recognize that the quality of the water flowing out of the river has a significant impact upon the water quality of the estuary. One scientist has likened the 134-mile long estuary and bay to a gigantic bath tub, with water being sloshed around by the tides, and having a dribble coming in at one end and a leak at the other end. It takes a drop of water 90 days to flush from the head of tides at Trenton to the Atlantic Ocean at Cape May, New Jersey.

DRBC water releases are expected to hold back ocean water to just below the confluence of the Schuylkill and Delaware rivers. However, in 1994 the DRBC had to admit that it could not provide enough flow to keep saltwater from infiltrating the water supplies of Camden and Philadelphia, creating an unknown future for the continuous taking of municipal water at Camden and Philadelphia from wells and intakes along the freshwater estuary. The 1995 report of the Delaware Estuary Program, the Comprehensive Conservation and Management Plan for the Delaware Estuary (CCMP) cites low flows caused by diversions and impoundments as one of the major problems in the estuary. The water quality in the Delaware, and especially the upper estuary from Philadelphia back to Trenton, poses difficult land use and water planning problems, in part caused by flow-related conditions.

Projected population increases of about 14% by the year 2020 will put the river's ecosystem and water supplies under increasing stress

The Lower Delaware River Management Plan sets forth resource and land management techniques that will help maintain good water quality in the lower Delaware River. Projected population increases of about 14% by the year 2020 will put the river's ecosystem and water supplies under increasing stress. The land use planning we do now will save valuable resources for the future. In planning for residential and commercial development it is essential to reduce the potential for soil erosion and sedimentation and storm water runoff, which can degrade water quality and aggravate existing sedimentation problems in the estuary. Preservation of native plant species along the river and stream banks and wetland areas will further protect water quality by preventing excessive erosion and filtering impurities entering waterways.

Furthermore, the river corridor today is a valuable recreation and tourism resource, providing millions of people in the region an opportunity to get in touch with nature and their heritage. The D&R Canal State Park, the Delaware Canal State Park, and Ralph Stover State Park attract nearly three million visitors each year. A comprehensive economic study of the Upper Delaware National Scenic and Recreational River found that it generated close to $60 million in economic impact and $20 million in direct expenditures by the National Park Service in 1986. Recreational and tourist use needs to be properly managed to protect the very resources that attract visitors.

There is much beauty along the Delaware, providing a vital resource for economic development and a birthright for future generations. This management plan provides goals and strategies that can help protect water quality and valuable river resources.

Section II:

Description of the Study Area Resources

OSPREY

The lower Delaware River is unique in its diversity of significant resources. A high density of population and recreational opportunities combine here with a wealth of natural, cultural and historic features of unparalleled national significance. The river valley contains habitats that do not occur elsewhere in the region. For example, there are sheer cliffs that rise 400 feet above the river. Southern facing cliffs are dry and desert-like, and are home to prickly pear cactus. North-facing cliffs exhibit flora usually found only in arctic-alpine climates. The river itself provides habitat for American shad, striped bass, and river herring, providing a high quality recreational and economic resource. The river is an important component of the Atlantic Flyway, one of four major waterfowl routes in North America. From an historic viewpoint, the river is one of the most significant corridors in the nation, with crucial infrastructure still intact. The corridor contains buildings used during Washington's famous crossing, historic navigation canals, Native American and colonial era archaeological sites, mills, etc. Just as important is the magnificent scenery. The view from the river for most of its length is of an undisturbed natural area, despite development taking place in the corridor.

The Lower Delaware Wild and Scenic Task Force identified five major categories of resources that require proper management in order to protect the river corridor:

Water Quality

Natural Resources

Historic Resources

Recreation

Open Space

In addition, Economic Development and its relationship to river management is discussed, and guidelines for Education and Outreach are presented. Each of these categories is described in detail below. The relevant goals, policies and implementation strategies as determined by the Task Force are set forth in Section IV.